PATENT ABSTRACTS OF JAPAN

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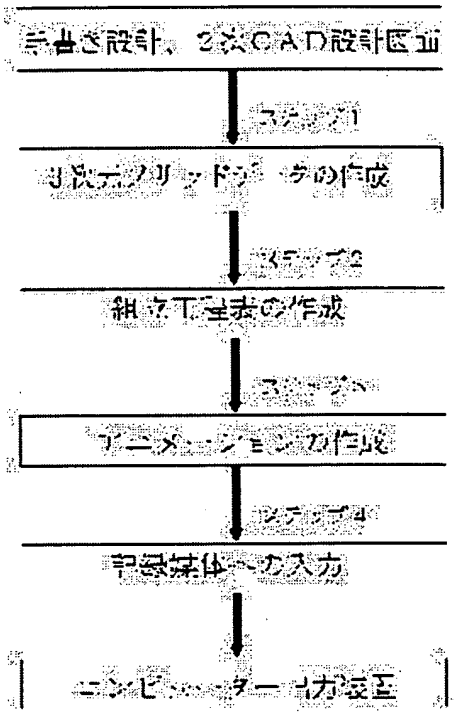
(54) ASSEMBLY PROCESS SUPPORT SYSTEM AND RECORDING MEDIUM RECORDED WITH ITS DATA

(57)Abstract:
PROBLEM TO BE SOLVED: To enable many persons to easily understand assembly and disassembly processes in a short time regardless of difference in experience or language even in the case of complicated installing work, by making the persons see solid figures or a smoothly moving animation image in early stages of production preparation.
SOLUTION: In this system, three-dimensional solid data on all constituent components are generated by a three-dimensional CAD or a modeling software on the basis of design drawings for various assemblies and subassemblies designed by a two-dimensional CAD or a hand-drawn design, the projections and the perspective drawings with the shadow are generated on the basis of the data by a marketing animation software, and an assembling process schedule which solidly displays a structure of each the assembly in order and which allows one-glance recognition of the processes of assembly and disassembly is generated. An animation showing the assembly and the disassembly is generated on the basis of the three-dimensional solid data and the image data by a marketed animation software, and the respective data are processed by a computer to visually confirm the assembly and disassembly processes.



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CLAIMS

[Claim(s)]
[Claim 1] Based on engineering drawing of the various assemblies designed in a handwriting design or two-dimensional CAD, and a sub assembly Create the three-dimension solid data of all component parts with three dimensional CAD or modeling software, and the projection drawing and perspective drawing which have shading by commercial animation software are created based on the above-mentioned three-dimension solid data. While the erector the configuration of an assembly is displayed in good order in three dimensions, and it was made to understand the procedure of assembly and decomposition at a glance creates a table The erector characterized by creating the animation which expresses assembly and decomposition with commercial animation software based on the above-mentioned three-dimension solid data and image data, processing each data by computer, and enabling it to check assembly and a decomposition process by vision is a support system.
[Claim 2] Based on engineering drawing of the various assemblies designed in a handwriting design or two-dimensional CAD, and a sub assembly Cover all component parts with three dimensional CAD or modeling software, create three-dimension solid data, and the projection drawing and perspective drawing which have shading by commercial animation software are created based on the above-mentioned three-dimension solid data. The erector to whom the number of each component part etc. was attached so that he could understand the process easily one by one from assembly initiation A table, While main component parts are disassembled on the assembly shaft of an assembly and the erector assembly and decomposition enabled it to understand easily creates a table, respectively The record medium characterized by having created the animation which expresses assembly and decomposition with commercial animation software based on the above-mentioned three-dimension solid data and image data, and recording each of that data possible [read] by computer.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention -- the assembly and the decomposition process of an assembly -- vision -- with -- **** -- it is related with the support system carried out as [check / it] and the record medium which recorded the data possible [read] by computer.
[0002]
[Description of the Prior Art] Although a handwriting design decreases sharply and a three-dimension solid design recognizes the importance in the guarantee side of quality by the advance of a computer in the various industries of making an object, it is seldom carried out from the difficulty of the cost quantity and actuation technique, but two-dimensional CAD is still the mainstream of a design in the present condition.
[0003] Therefore, in the development stage of a new product and new goods, the design section of each enterprise carries out a need number-of-copies copy, and carries out the release of drawing of that development engineering drawing to a production preparation section, a production section, an inspection section, a purchase section, overseas works, etc., and each section is in the situation of drawing up various kinds of production preparation plans with this paper drawing etc.
[0004]
[Problem(s) to be Solved by the Invention] However, by the above-mentioned conventional approach, it cannot but depend on the altitude engineer and technician of each section who assemble how or have the thing what kind of instrument, equipment, and whose facility are need, and experience and skill considerable in order to judge **, such as a make/buy business partition in which made in outside was further included in decision of workspace, operation standard time amount, manufacture cost, etc. again, proper.
[0005] Moreover, even if it is the altitude engineer and technician of each section, in order that many people may evaluate, respectively, judging from engineering drawing, by an oversight, a misapprehension, etc. occurring plentifully, they induce trouble generating before the increment in a prototype activity, or production initiation, and the period compaction before the production initiation which is the current maximum needs cannot be measured after all,, either, and it has also become an increase of cost.
[0006] Moreover, in actual assembly operation, the people of high skill carry out the practice acquisition of the procedure first. Since everyone can understand easily even if the approach of educating this by OJT (on the job training) to a weak annual layer or an inexperienced person is most and the metaphor assembly procedure and the description are drawn up, By the time it memorized assembly operation completely and came to have completed within standard operation time, it needed to repeat repeatedly, and needed to educate and teach.
[0007] furthermore, the case where production initiation is carried out at overseas works -- the preparation sake -- the engineer from Japan, and a skill member -- a scale -- doubling -- a lot of people and a long period of time -- continuing -- not dispatching -- it did not obtain and the increase of cost was not able to be avoided.
[0008] Since similarly there was no clear operation standard which the man of a spot can perform

easily on the occasion of failure or repair when a device etc. is exported to overseas from Japan, the high technician had to be dispatched from Japan and it became cost quantity. Moreover, OJT which exact instruction cannot be enough performed for a short period of time even if there is the problem of language and it carrie[redacted] an overseas business trip, but time a[redacted]nt and cost require was in use.

[0009] then , an assembly consist of many components in view of the above-mentioned various difficulties , and he overcome the difference of experience , and the wall of language and it enable it to understand a routing easily in this invention in a short time at many people by see pictorial drawing and the animation image which move smoothly , without be base on engineering drawing and the description which be wrote to paper from the early phase of production preparation , even when an activity with a group be complicated .

[0010]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the erector concerning this invention a support system Based on engineering drawing of the various assemblies designed in a handwriting design or two-dimensional CAD, and a sub assembly Create the three-dimension solid data of all component parts with three dimensional CAD or modeling software, and the projection drawing and perspective drawing which have shading by commercial animation software are created based on the above-mentioned three-dimension solid data. While the erector the configuration of an assembly is displayed in good order in three dimensions, and it was made to understand the procedure of assembly and decomposition at a glance creates a table Based on the above-mentioned three-dimension solid model and image data, the animation which expresses assembly and decomposition with commercial animation software was created, and the data was processed by computer, and it constituted so that assembly and a decomposition process could be checked by vision.

[0011] The record medium concerning this invention moreover, based on engineering drawing of the various assemblies designed in a handwriting design or two-dimensional CAD, and a sub assembly Cover all component parts with three dimensional CAD or modeling software, create three-dimension solid data, and the projection drawing and perspective drawing which have shading by commercial animation software are created based on the above-mentioned three-dimension solid data. The erector to whom the number of each component part etc. was attached so that he could understand the process easily one by one from assembly initiation A table, While main component parts are disassembled on the assembly shaft of an assembly and the erector assembly and decomposition enabled it to understand easily creates a table, respectively Based on the above-mentioned three-dimension solid data and image data, the animation which expresses assembly and decomposition with commercial animation software was created, and the data was recorded possible [read] and consisted of computers.

[0012]

[Embodiment of the Invention] In covering all component parts based on engineering drawing of the various assemblies designed in a handwriting design or two-dimensional CAD, or a sub assembly and creating solid data Are B-reps and CSG DS which had the connection relation between a point / ridgeline / field (topology) with the actual configuration (geometry) of a point / ridgeline / field, or IGES, STL, STEP and DXF, 3D S, OBJ, IDE, and IDS, It is the file format which can perform exchange of other software and data, such as a WRL format, Inventor, DXF3D, a Shade format, and a LightWave3D format, and CAD and modeling software of marketing which has a data I/O function can be used.

[0013] Moreover, while creating the projection drawing and perspective drawing which have shading based on three-dimension solid data The erector to whom the number of each component part etc. was attached so that he could understand the process easily one by one from assembly initiation based on projection drawing and perspective drawing A table, When main component parts are disassembled on the assembly shaft of an assembly and the erector assembly and decomposition enabled it to understand easily creates a table, respectively Have a solid CAD kernel or IGES, STL, STEP, DXF, 3D S, OBJ, IGE, and IGS, a WRL format, Inventor, DXF3D, a Shade format, a LightWave3D format, BMP, JPEG, PICT, GIF, a Photoshop format, PNG, the QuickTime image SGI, It

is the file format which can perform exchange of other software and data, such as TRAGA, and TIFF, EPS, and the animation software of marketing which has a data I/O function can be used.
[0014] furthermore, in creating assembly and decomposition animation based on three-dimension solid data and image data Can pe[redacted]m various processings, such as color a[redacted]hment, an alphabetic character input, and anti-aliasing processing, or IGES, STL, STEP and DXF, [redacted]S, OBJ, IGE, and IGS, Inventor, DXF3D, a Shade format, a Light Wave3D format, BMP, JPEG, PICT, a Photoshop format, PNG, the QuickTime image SGI, It is the file format which can perform exchange of other software and data, such as QuickTime video containing TRAGA, TIFF, AVI and MPEG, and Cinepark, and GIF, EPS, and the animation software of marketing which has a data I/O function can be used.
[0015] Moreover, as a record medium, record media, such as the medium which can record the data of a computer, for example, CD, MO, DVD, DAT, ZIP, JAZ, SuperDisk, and PD, and a data cartridge, can be used.
[0016]
[Example] In this example, as shown in the flow chart of drawing 1 , it consists of the step which creates the three-dimension solid data about the component part of an assembly, the step to which the erector about the bill of materials and assembly procedure of an assembly creates a table, a step which creates the animation showing assembly and decomposition, and a step which records each data possible [reading] by computer. Hereafter, it is attached to each above-mentioned step, and explains in full detail, respectively.
[0017]
Step 1 (creation of three-dimension solid data)
Based on two-dimensional engineering drawing currently used abundantly in the current industrial world, it has the format which can perform exchange of other software and data, and solid-model-izes using the various modeling software of marketing which has a data I/O function, for example, Think design, iron CAD, CADCEUS, CATIA, Solid Works (all are brand names), etc.
[0018] Step 2 (creation of a table like an erector)
Next, the projection drawing which has the format which can perform exchange of other software and data based on the three-dimension solid data created at the above-mentioned step 1, and has shading of a component part and an assembly using the animation software of marketing which has a data I/O function, for example, SOFT IMAGE, 3D Studio MAX, Shade, Light Wave (all are brand names), etc., and the whole perspective drawing which saw through the interior of an assembly are created. moreover, a part which is easy to understand about the part of components hard to see on an activity — an enlarged drawing and the perspective drawing of components are created. Processing processing of healing and staining, anti-aliasing, a rendering, geometry / raster processing, a texture / environment / reflection / transparency / bump mapping, etc., etc. is suitably performed in that case.
[0019] After an appropriate time, on screens, such as conformal projection and a perspective, while color attachment or alphabetic character input anti-aliasing processing carries out various processings, as shown at drawing 4 thru/or drawing 6 The erector to whom the number 40 of each component part and the name 41 grade were attached so that he can understand the process easily one by one from assembly initiation Table A Main component parts are disassembled on the assembly shaft of an assembly, the alphabetic character 51 grade showing the number 50 of each component part and notes on an activity is attached, and the erector assembly and decomposition enabled it to understand easily creates Table B, respectively.
[0020]
Step 3 (creation of assembly and decomposition animation)
It is the format which can perform exchange of other software and data based on the above-mentioned three-dimension solid and image data, and using the various animation software which has a data I/O function, for example, SOFT IMAGE, 3D Studio MAX, Shade, Light Wave (all are brand names), etc., a real activity and the directions of a procedure with a group expected are given, and assembly and decomposition animation creation are carried out.
[0021] The O ring is contained in the inside in that case, for example, components with a group, in inserting in the outside of components, although the actuation with a group is expressed, as an O

ring is expanded, it attaches it in it, and in inserting in inside components, it expresses the condition of being attached as an O ring is compressed. Moreover, about the insertion which becomes the interior and a shadow, perspective drawing, an expansion image, etc. are utilized and a situation with a group makes it intelligible. Furt[redacted]more, in attaching a threaded fastener, [redacted]** rotates and expresses the condition of ** screwing on.

[0022] Step 4 (input to a record medium)

The projection drawing of an assembly created as mentioned above and perspective drawing, and an erector record each virtual processing data of Tables A and B, and assembly and decomposition animation on various kinds of record media possible [read] by computer, and enable it to provide a customer with it.

[0023] The assembly and the decomposition process of an assembly are made to check visually, and it can be made to perform exchange of making an object in a production site by **(ing), carrying out computer processing of the data stored in these record media, and projecting the assembly and the decomposition process of an assembly by the monitor.

[0024]

[Effect of the Invention] Since according to this invention it consists of many components, and an assembly can understand an assembly procedure easily in a short time even when an activity with a group is complicated, while cannot require skill, being able to carry out it and being able to raise working capacity sharply, the period compaction before production initiation can be measured. It ** and the attachment leakage of components etc. can be prevented.

[0025] Moreover, a product can be unified as specification by using the common assembly support system concerning this invention until it results in the purchase for production preparation, industrial engineering, equipment planning, manufacture, and inspection.

[0026] Moreover, this invention can be used instead of operation manuals, such as various kinds of machines, an instrument, equipment, and a facility, and a repair procedure. Furthermore, it uses and is the the best for various activity instruction education, and since the failure of language can be overcome in this case, educational cost can be reduced remarkably.

[0027] Furthermore, since it can transmit again using the Internet when you need this invention article in a long distance, many effectiveness which was [decrease /, sharply / the need of sending an engineer and a technician abroad] excellent is produced.

[0028]

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention -- the assembly and the decomposition process of an assembly -- vision -- with -- **** -- it is related with the support system carried out as [check / it] and the record medium which recorded the data possible [read] by computer.

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PRIOR ART

[Description of the Prior Art] Although a handwriting design decreases sharply and a three-dimension solid design recognizes the importance in the guarantee side of quality by the advance of a computer in the various industries of making an object, it is seldom carried out from the difficulty of the cost quantity and actuation technique, but two-dimensional CAD is still the mainstream of a design in the present condition.
[0003] Therefore, in the development stage of a new product and new goods, the design section of each enterprise carries out a need number-of-copies copy, and carries out the release of drawing of that development engineering drawing to a production preparation section, a production section, an inspection section, a purchase section, overseas works, etc., and each section is in the situation of drawing up various kinds of production preparation plans with this paper drawing etc.

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EFFECT OF THE INVENTION

[Effect of the Invention] Since according to this invention it consists of many components, and an assembly can understand an assembly procedure easily in a short time even when an activity with a group is complicated, while cannot require skill, being able to carry out it and being able to raise working capacity sharply, the period compaction before production initiation can be measured. It ** and the attachment leakage of components etc. can be prevented.
[0025] Moreover, a product can be unified as specification by using the common assembly support system concerning this invention until it results in the purchase for production preparation, industrial engineering, equipment planning, manufacture, and inspection.
[0026] Moreover, this invention can be used instead of operation manuals, such as various kinds of machines, an instrument, equipment, and a facility, and a repair procedure. Furthermore, it uses and is the the best for various activity instruction education, and since the failure of language can be overcome in this case, educational cost can be reduced remarkably.
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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, by the above-mentioned conventional approach, it cannot but depend on the altitude engineer and technician of each section who assemble how or have the thing what kind of instrument, equipment, and whose facility are need, and experience and skill considerable in order to judge **, such as a make/buy business partition in which made in outside was further included in decision of workspace, operation standard time amount, manufacture cost, etc. again, proper.
[0005] Moreover, even if it is the altitude engineer and technician of each section, in order that many people may evaluate, respectively, judging from engineering drawing, by an oversight, a misapprehension, etc. occurring plentifully, they induce trouble generating before the increment in a prototype activity, or production initiation, and the period compaction before the production initiation which is the current maximum needs cannot be measured after all,, either, and it has also become an increase of cost.
[0006] Moreover, in actual assembly operation, the people of high skill carry out the practice acquisition of the procedure first. Since everyone can understand easily even if the approach of educating this by OJT (on the job training) to a weak annual layer or an inexperienced person is most and the metaphor assembly procedure and the description are drawn up, By the time it memorized assembly operation completely and came to have completed within standard operation time, it needed to repeat repeatedly, and needed to educate and teach.
[0007] furthermore, the case where production initiation is carried out at overseas works -- the preparation sake -- the engineer from Japan, and a skill member -- a scale -- doubling -- a lot of people and a long period of time -- continuing -- not dispatching -- it did not obtain and the increase of cost was not able to be avoided.
[0008] Since similarly there was no clear operation standard which the man of a spot can perform easily on the occasion of failure or repair when a device etc. is exported to overseas from Japan, the high technician had to be dispatched from Japan and it became cost quantity. Moreover, OJT which exact instruction cannot be enough performed for a short period of time even if there is the problem of language and it carries out an overseas business trip, but time amount and cost require was in use.
[0009] then , an assembly consist of many components in view of the above-mentioned various difficulties , and he overcome the difference of experience , and the wall of language and it enable it to understand a routing easily in this invention in a short time at many people by see pictorial drawing and the animation image which move smoothly , without be base on engineering drawing and the description which be wrote to paper from the early phase of production preparation , even when an activity with a group be complicated .

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the erector concerning this invention a support system Based on engineering drawing of the various assemblies designed in a handwriting design or two-dimensional CAD, and a sub assembly Create the three-dimension solid data of all component parts with three dimensional CAD or modeling software, and the projection drawing and perspective drawing which have shading by commercial animation software are created based on the above-mentioned three-dimension solid data. While the erector the configuration of an assembly is displayed in good order in three dimensions, and it was made to understand the procedure of assembly and decomposition at a glance creates a table Based on the above-mentioned three-dimension solid model and image data, the animation which expresses assembly and decomposition with commercial animation software was created, and the data was processed by computer, and it constituted so that assembly and a decomposition process could be checked by vision.
[0011] The record medium concerning this invention moreover, based on engineering drawing of the various assemblies designed in a handwriting design or two-dimensional CAD, and a sub assembly Cover all component parts with three dimensional CAD or modeling software, create three-dimension solid data, and the projection drawing and perspective drawing which have shading by commercial animation software are created based on the above-mentioned three-dimension solid data. The erector to whom the number of each component part etc. was attached so that he could understand the process easily one by one from assembly initiation A table, While main component parts are disassembled on the assembly shaft of an assembly and the erector assembly and decomposition enabled it to understand easily creates a table, respectively Based on the above-mentioned three-dimension solid data and image data, the animation which expresses assembly and decomposition with commercial animation software was created, and the data was recorded possible [read] and consisted of computers.
[0012]
[Embodiment of the Invention] In covering all component parts based on engineering drawing of the various assemblies designed in a handwriting design or two-dimensional CAD, or a sub assembly and creating solid data Are B-reps and CSG DS which had the connection relation between a point / ridgeline / field (topology) with the actual configuration (geometry) of a point / ridgeline / field, or IGES, STL, STEP and DXF, 3D S, OBJ, IDE, and IDS, It is the file format which can perform exchange of other software and data, such as a WRL format, Inventor, DXF3D, a Shade format, and a LightWave3D format, and CAD and modeling software of marketing which has a data I/O function can be used.
[0013] Moreover, while creating the projection drawing and perspective drawing which have shading based on three-dimension solid data The erector to whom the number of each component part etc. was attached so that he could understand the process easily one by one from assembly initiation based on projection drawing and perspective drawing A table, When main component parts are disassembled on the assembly shaft of an assembly and the erector assembly and decomposition enabled it to understand easily creates a table, respectively Have a solid CAD kernel or IGES, STL, STEP, DXF, 3D S, OBJ, IGE, and IGS, a WRL format, Inventor, DXF3D, a Shade format, a LightWave3D format, BMP, JPEG, PICT, GIF, a Photoshop format, PNG, the QuickTime image SGI, It

is the file format which can perform exchange of other software and data, such as TRAGA, and TIFF, EPS, and the animation software of marketing which has a data I/O function can be used.
[0014] furthermore, in creating assembly and decomposition animation based on three-dimension solid data and image data Can perform various processings, such as color attachment, an alphabetic character input, and anti-aliasing processing, or IGES, STL, STEP and DXF, DWS, OBJ, IGE, and IGS, Inventor, DXF3D, a Shade format, a Light Wave3D format, BMP, JPEG, PICT, a Photoshop format, PNG, the QuickTime image SGI, It is the file format which can perform exchange of other software and data, such as QuickTime video containing TRAGA, TIFF, AVI and MPEG, and Cinepark, and GIF, EPS, and the animation software of marketing which has a data I/O function can be used.
[0015] Moreover, as a record medium, record media, such as the medium which can record the data of a computer, for example, CD, MO, DVD, DAT, ZIP, JAZ, SuperDisk, and PD, and a data cartridge, can be used.

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EXAMPLE

[Example] In this example, as shown in the flow chart of drawing 1 , it consists of the step which creates the three-dimension solid data about the component part of an assembly, the step to which the erector about the bill of materials and assembly procedure of an assembly creates a table, a step which creates the animation showing assembly and decomposition, and a step which records each data possible [reading] by computer. Hereafter, it is attached to each above-mentioned step, and explains in full detail, respectively.
[0017]
Step 1 (creation of three-dimension solid data)
Based on two-dimensional engineering drawing currently used abundantly in the current industrial world, it has the format which can perform exchange of other software and data, and solid-models using the various modeling software of marketing which has a data I/O function, for example, Think design, iron CAD, CADCEUS, CATIA, Solid Works (all are brand names), etc.
[0018] Step 2 (creation of a table like an erector)
Next, the projection drawing which has the format which can perform exchange of other software and data based on the three-dimension solid data created at the above-mentioned step 1, and has shading of a component part and an assembly using the animation software of marketing which has a data I/O function, for example, SOFT IMAGE, 3D Studio MAX, Shade, Light Wave (all are brand names), etc., and the whole perspective drawing which saw through the interior of an assembly are created. moreover, a part which is easy to understand about the part of components hard to see on an activity -- an enlarged drawing and the perspective drawing of components are created. Processing processing of healing and staining, anti-aliasing, a rendering, geometry / raster processing, a texture / environment / reflection / transparency / bump mapping, etc., etc. is suitably performed in that case.
[0019] After an appropriate time, on screens, such as conformal projection and a perspective, while color attachment or alphabetic character input anti-aliasing processing carries out various processings, as shown at drawing 4 thru/or drawing 6 The erector to whom the number 40 of each component part and the name 41 grade were attached so that he can understand the process easily one by one from assembly initiation Table A Main component parts are disassembled on the assembly shaft of an assembly, the alphabetic character 51 grade showing the number 50 of each component part and notes on an activity is attached, and the erector assembly and decomposition enabled it to understand easily creates Table B, respectively.
[0020]
Step 3 (creation of assembly and decomposition animation)
It is the format which can perform exchange of other software and data based on the above-mentioned three-dimension solid and image data, and using the various animation software which has a data I/O function, for example, SOFT IMAGE, 3D Studio MAX, Shade, Light Wave (all are brand names), etc., a real activity and the directions of a procedure with a group expected are given, and assembly and decomposition animation creation are carried out.
[0021] The O ring is contained in the inside in that case, for example, components with a group, in inserting in the outside of components, although the actuation with a group is expressed, as an O ring is expanded, it attaches it in it, and in inserting in inside components, it expresses the condition

of being attached as an O ring is compressed. Moreover, about the insertion which becomes the interior and a shadow, perspective drawing, an expansion image, etc. are utilized and a situation with a group makes it intelligible. Furthermore, in attaching a threaded fastener, **** rotates and expresses the condition of ** s[redacted]ng on.

[0022] Step 4 (input to a record medium)

The projection drawing of an assembly created as mentioned above and perspective drawing, and an erector record each virtual processing data of Tables A and B, and assembly and decomposition animation on various kinds of record media possible [read] by computer, and enable it to provide a customer with it.

[0023] The assembly and the decomposition process of an assembly are made to check visually, and it can be made to perform exchange of making an object in a production site by **(ing), carrying out computer processing of the data stored in these record media, and projecting the assembly and the decomposition process of an assembly by the monitor.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the flow chart which shows one example of the system concerning this invention.
[Drawing 2] It is the projection drawing of an assembly.
[Drawing 3] It is the whole assembly perspective drawing.
[Drawing 4] It is the projection drawing where an erector expresses a part of table A.
[Drawing 5] It is the projection drawing where an erector expresses a part of table B.
[Drawing 6] It is the projection drawing where an erector expresses a part of table B.

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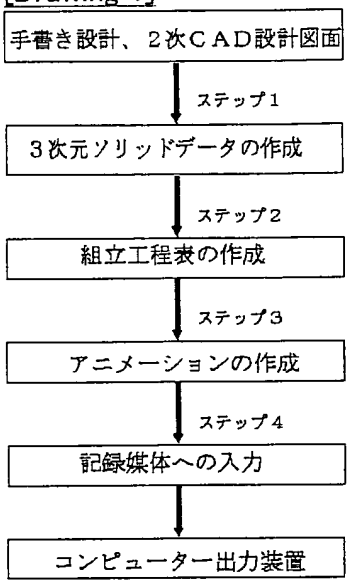
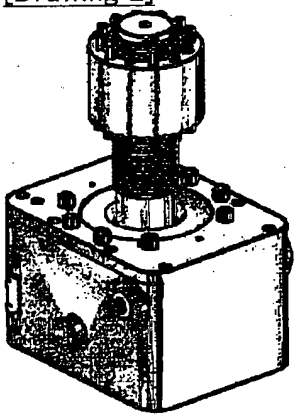
DRAWINGS

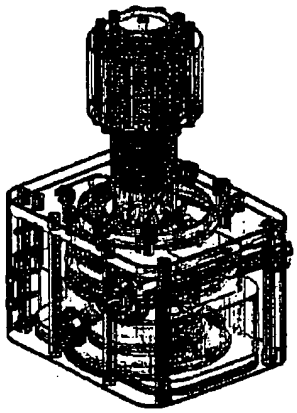
[Drawing 1]



[Drawing 2]

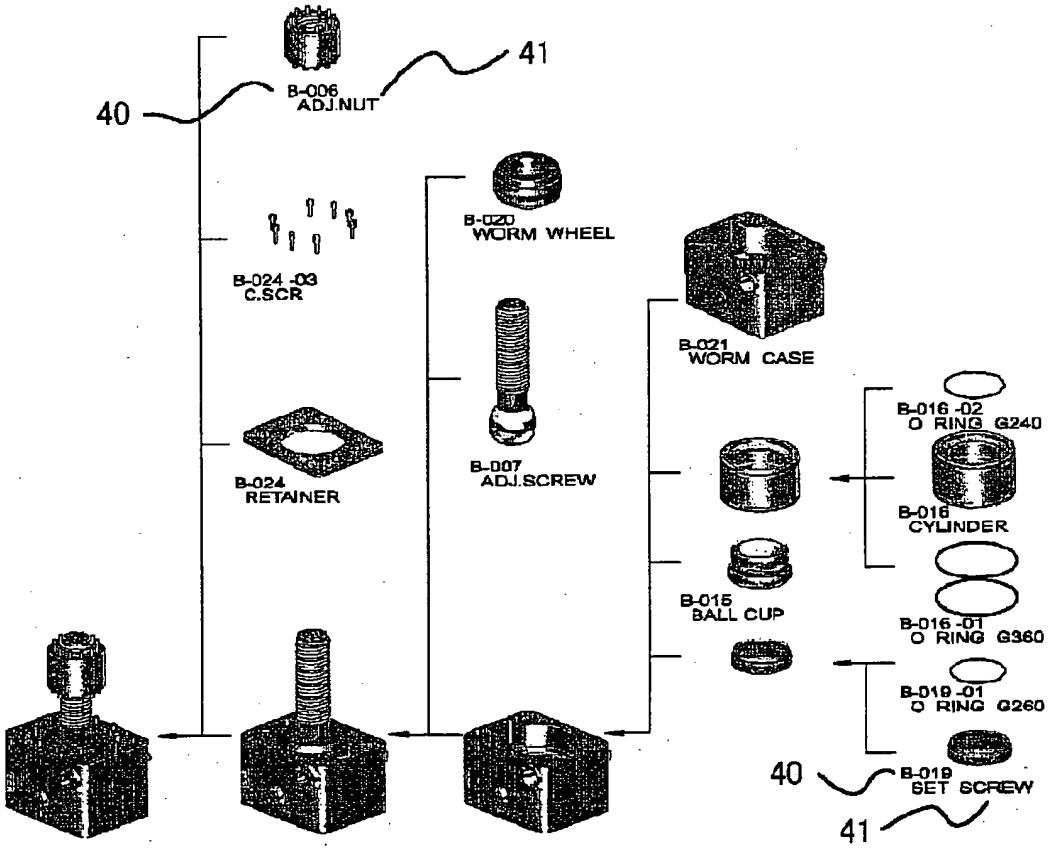


[Drawing 3]



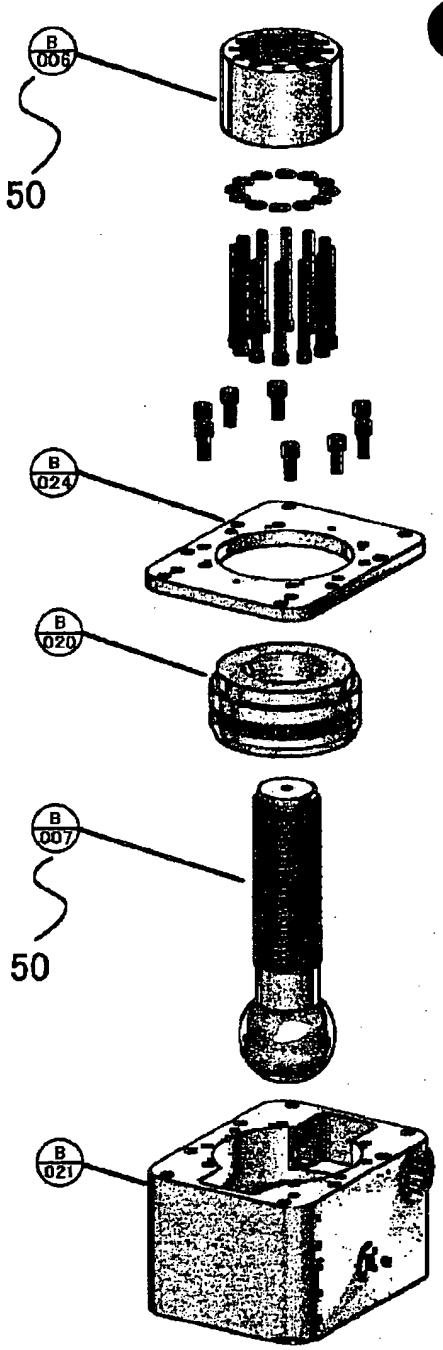
[Drawing 4]

組立工程表A



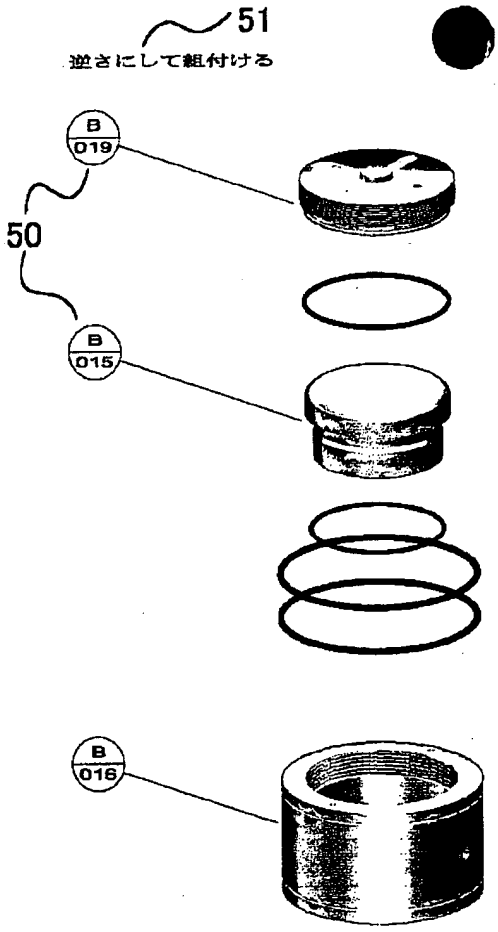
[Drawing 5]

組立工程表B



[Drawing 6]

組立工程表B



[Translation done.]

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Ｇ０６Ｆ　17/50	６０８	Ｇ０６Ｆ　17/50	６０８Ａ　５Ｂ０

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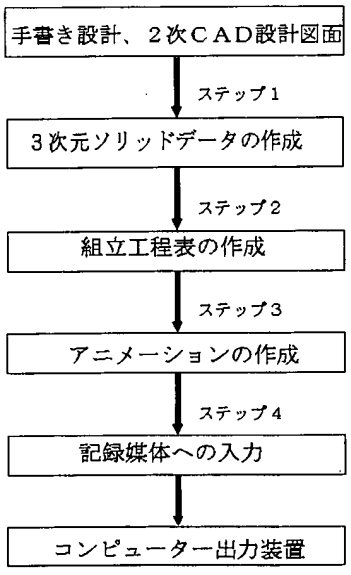
FA20 GA01
5B050 AA03 BA08 BA17 EA24 E
EA28 EA30 FA02

(54)【発明の名称】　組立工程支援システム及びそのデータを記録した記録媒体

(57)【要約】
【課題】　生産準備の早い段階から、組付け作業が複雑な場合でも、立体図や滑らかに動くアニメーション画像を見ることによって、経験の差や言語の壁を乗り越えて、多くの人達に組立、分解工程を短時間に容易に理解できるようにする。
【解決手段】　手書設計や２次元ＣＡＤにて設計された各種組立品及びサブ組立品の設計図を基に、３次元ＣＡＤやモデリングソフトで全ての構成部品の３次元ソリッドデータを作成し、上記データを基に、市販のアニメーションソフトで陰影を持つ投影図及び透視図を作成して、組立品の構成が順序良く立体的に表示され、また組立及び分解の手順が一目で分かるようにした組立工程表を作成すると共に、上記３次元ソリッドデータと画像データを基に、市販のアニメーションソフトで組立及び分解を表すアニメーションを作成し、各データをコンピューターで処理して、組立、分解工程を視覚により確認し得るように構成した。



【特許請求の範囲】
【請求項１】　手書設計や２次元[redacted]Ｄにて設計された各種組立品及びサブ組立品の設計図を基に、３次元ＣＡＤやモデリングソフトで全ての構成部品の３次元ソリッドデータを作成し、上記３次元ソリッドデータを基に、市販のアニメーションソフトで陰影を持つ投影図及び透視図を作成して、組立品の構成が順序良く立体的に表示され、また組立及び分解の手順が一目で分かるようにした組立工程表を作成すると共に、上記３次元ソリッドデータと画像データを基に、市販のアニメーションソフトで組立及び分解を表すアニメーションを作成し、各データをコンピューターで処理して、組立、分解工程を視覚により確認し得るようにしたことを特徴とする組立工程支援システム。
【請求項２】　手書設計や２次元ＣＡＤにて設計された各種組立品及びサブ組立品の設計図を基に、３次元ＣＡＤやモデリングソフトで全ての構成部品に亘り３次元ソリッドデータを作成し、上記３次元ソリッドデータを基に、市販のアニメーションソフトで陰影を持つ投影図及び透視図を作成して、組立開始から順次そのプロセスを容易に理解できるように各構成部品のナンバー等が付けられた組立工程表と、組立品の組立軸上に主要構成部品が分解されていて、組立及び分解が容易に理解できるようにした組立工程表を夫々作成すると共に、上記３次元ソリッドデータと画像データを基に、市販のアニメーションソフトで組立、分解を表わすアニメーションを作成して、その各データをコンピューターで読取り可能に記録したことを特徴とする記録媒体。
【発明の詳細な説明】
【０００１】
【発明が属する技術分野】本発明は、組立品の組立・分解工程を視覚を以って確認できるようした支援システムと、そのデータをコンピューターで読取り可能に記録した記録媒体に関する。
【０００２】
【従来の技術】物作りの各種業界では、コンピューターの進歩により、手書き設計は大幅に減少し、３次元ソリッド設計は品質の保証面において、その重要性を認識しつつも、そのコスト高や操作技術の難しさから余り行われておらず、現状では未だ２次元ＣＡＤが設計の主流である。
【０００３】従って、新製品、新商品の開発段階において、各事業の設計部門はその開発設計図を、生産準備部門、生産部門、検査部門、購買部門や海外工場等に必要部数複写して出図し、各部門は、この紙図面等により各種の生産準備計画を立案している状況である。
【０００４】
【発明が解決しようとする課題】しかし、上記従来の方法では、どのように組立てるか、どのような道具、装置、設備が必要なのか、また作業スペース、作業標準時間、製作コスト等の判断に当り、更には外製を外作業区分等々を適格に[redacted]するためには、相と熟練を持つ各部門の高度技術者及び技能者にを得ない。
【０００５】また、各部門の高度技術者及び技っても、夫々多くの人が設計図のみから判断、ため、見落し、勘違い等が多々発生し、結局そ作作業の増加や生産開始前のトラブル発生を誘在の最大ニーズである生産開始前の期間短縮もまたコスト増にもなっている。
【０００６】また、実際の組立作業においてはの人達が先ず手順を実践取得し、これを弱年層者にOJT (on the job training) で教育する方であり、例え組立手順書や説明書が作成されて誰もが容易に理解できるようにはなっていない全に組立作業を覚え、標準作業時間内で完了すなるまでには、何回も繰り返して教育、指導すあった。
【０００７】更に、海外の工場で生産開始するの準備のために日本国内から技術員、技能員をわせて多人数、長期間に亘り派遣せざるを得ず増を避けられなかった。
【０００８】同様に、日本から海外に機器などた場合、故障や修繕に際し、現地の人が容易にる明快な作業標準がないために、日本から高技遣しなければならずコスト高になった。また言があり、海外派遣しても正確な指導が短期間にず、時間とコストの掛かるＯＪＴが主流であっ
【０００９】そこで、本発明においては、上記点に鑑み、組立品が多数の部品からなり、組付雑な場合でも、生産準備の早い段階から、紙に設計図や説明書によることなく、立体図や滑らアニメーション画像を見ることによって、経験語の壁を乗り越えて、多くの人達に作業工程を容易に理解し得るようにしたものである。
【００１０】
【課題を解決するための手段】上記目的を達成に、本発明に係る組立工程支援システムは、手２次元ＣＡＤにて設計された各種組立品及びサの設計図を基に、３次元ＣＡＤやモデリングソての構成部品の３次元ソリッドデータを作成し次元ソリッドデータを基に、市販のアニメーシトで陰影を持つ投影図及び透視図を作成して、構成が順序良く立体的に表示され、また組立及手順が一目で分かるようにした組立工程表を作共に、上記３次元ソリッドモデルと画像データ市販のアニメーションソフトで組立及び分解をメーションを作成し、そのデータをコンピュー理して、組立、分解工程を視覚により確認し得構成した。

【００１１】また、本発明に係る[redacted]媒体は、手書設計や２次元ＣＡＤにて設計された各[redacted]立品及びサブ組立品の設計図を基に、３次元ＣＡＤやモデリングソフトで全ての構成部品に亘り３次元ソリッドデータを作成し、上記３次元ソリッドデータを基に、市販のアニメーションソフトで陰影を持つ投影図及び透視図を作成して、組立開始から順次そのプロセスを容易に理解できるように各構成部品のナンバー等が付けられた組立工程表と、組立品の組立軸上に主要構成部品が分解されていて、組立及び分解が容易に理解できるようにした組立工程表を夫々作成すると共に、上記３次元ソリッドデータと画像データを基に、市販のアニメーションソフトで組立、分解を表わすアニメーションを作成して、そのデータをコンピューターで読取り可能に記録して構成した。

【００１２】

【発明の実施の形態】手書設計や２次元ＣＡＤにて設計された各種組立品やサブ組立品の設計図を基にして、全ての構成部品に亘りソリッドデータを作成する場合には、点／稜線／面の実際の形状(ジオメトリ)と共に点／稜線／面の接続関係(トポロジ)を持ったＢ－ｒｅｐｓやＣＳＧデータ構造であったり、IGES、STL、STEP、DXF、3DS、OBJ、IDE、IDS、WRL形式、Inventor、DXF3D、Shade形式、LightWave3D形式等の、他のソフトとデータの交換が出来るファイル形式であって、データ入出力機能を有する市販のＣＡＤやモデリングソフトを用いることができる。

【００１３】また、３次元ソリッドデータを基にして陰影を持つ投影図及び透視図を作成すると共に、投影図及び透視図を基にして組立開始から順次そのプロセスを容易に理解できるように各構成部品のナンバー等が付けられた組立工程表と、組立品の組立軸上に主要構成部品が分解されていて、組立及び分解が容易に理解できるようにした組立工程表を夫々作成する場合には、ソリッドCADカーネルを有したり、IGES、STL、STEP、DXF,3DS、OBJ、IGE、IGS、WRL形式、Inventor、DXF3D、Shade形式、Light Wave3D形式、BMP、JPEG、PICT、GIF、Photoshop形式、PNG、QuickTimeイメージSGI、TRAGA、TIFF、EPS等の、他のソフトとデータの交換が出来るファイル形式であって、データ入出力機能を有する市販のアニメーションソフトを用いることが出来る。

【００１４】更に、３次元ソリッドデータと画像データを基にして、組立・分解アニメーションを作成する場合には、色彩付け、文字入力、アンチエイリアシング処理等の各種加工ができたり、IGES、STL、STEP、DXF,3DS、OBJ、IGE、IGS、Inventor、DXF3D、Shade形式、Light Wave3D形式、BMP、JPEG、PICT、Photoshop形式、PNG、QuickTimeイメージSGI、TRAGA、TIFF、AVI、MPEG、Cineparkを含むQuickTimeビデオ、GIF、EPS等の、他のソフトとデータの交換が出来るファイル形式であって、データ入出力機能を有する市販のアニメーションソフトを用いることが出来る。

【００１５】また、記録[redacted]しては、コンピデータが記録できる媒体、例えばＣＤ、MO、ＤＡＴ，ＺＩＰ、ＪＡＺ，SuperDisk、ＰＤ、ートリッジ等の記録媒体を用いることができる

【００１６】

【実施例】本実施例においては、図１のフローに示すように、組立品の構成部品に関する３次ドデータを作成するステップと、組立品の部品立手順に関する組立工程表を作成するステップ及び分解を表したアニメーションを作成するスと、各データをコンピューターで読み取り可能るステップからなる。以下、上記各ステップに詳説する。

【００１７】

ステップ１（３次元ソリッドデータの作成）

現在産業界で多用されている２次元設計図を基ソフトとデータの交換が出来る形式を持ち、デ力機能を有する市販の各種モデリングソフト、Think design、iron CAD、CADCEUS、CATIA、Scs等（いずれも商標名）を用いてソリッドモデる。

【００１８】ステップ２（組立工程表の作成）

次に、上記ステップ1で作成した３次元ソリッを基に、他のソフトとデータの交換が出来る形ち、データ入出力機能を有する市販のアニメーフト、例えば、SOFT IMAGE、3D Studio MAX、Sght Wave等（いずれも商標名）を用いて、構成組立品の陰影を持つ投影図と組立品の内部を透体透視図を作成する。また作業上、部品の見にについては理解し易いような一部拡大図や部品を作成する。その際、ヒーリング及び色付け、イリアシング、レンダリング、ジオメトリ／ラ理、テクスチャ／環境／反射／透明度／バンプグ等の加工処理を適宜行う。

【００１９】しかる後に、等角投影やパースペ等の画面で、色彩付け又は文字入力アンチエイグ処理等の各種加工しながら、図４乃至図６にに、組立開始から順次そのプロセスを容易に理ように、各構成部品のナンバー40、名称41等がた組立工程表Ａと、組立品の組立軸上に主要構分解されていて、各構成部品のナンバー50、作意事項を表す文字51等を付けて、組立及び分解理解できるようにした組立工程表Ｂとを夫々作

【００２０】

ステップ３（組立・分解アニメーションの作成上記３次元ソリッド及び画像データを基にしてフトとデータの交換が出来る形式であって、デ力機能を有する各種アニメーションソフト、例FT IMAGE、3D Studio MAX、Shade、Light Wave

れも商標名）を用いて、実作業や[redacted]される組付手順の指示を与えて、組立・分解アニメ[redacted]ョン作成する。

【００２１】その際、例えば組付部品中にＯリングが含まれており、その組付動作を表現するのに、部品の外側に嵌める場合にはＯリングを拡大するようにして取付け、部品の内側に嵌める場合にはＯリングを圧縮するようにして取付けられる状態を表わす。また、内部や影になるところ等への挿入に関しては、透視図や拡大映像等を活用して、組付状況が分かり易くする。更に、ねじ部品を組付ける場合には、ねじが回転し乍ら螺着する状態を表現するようにする。

【００２２】ステップ４（記録媒体への入力）

以上のようにして作成された、組立品の投影図及び透視図、組立工程表Ａ，Ｂ、組立・分解アニメーションの各バーチャル加工データを、各種の記録媒体にコンピューターで読取り可能に記録して顧客に提供できるようにする。

【００２３】而して、これらの記録媒体に格納されたデータをコンピューター処理して、組立品の組立及び分解工程をモニターで映し出すことにより、組立品の組立及び分解工程を視覚で確認させ、生産現場での物作りの支援ができるようにする。

【００２４】

【発明の効果】本発明によると、組立品が多数の部品からなり、組付作業が複雑な場合でも組立手順を短時間に容易に理解できるので、熟練を要せずして作業能率を大幅に高めることが出来ると共に、生産開始前のを計ることが出来る。而[redacted]部品の組付け漏ぐことができる。

【００２５】また、生産準備のための購買、生設備計画、製造、検査に至るまで、本発明に係組立支援システムを使用することにより、製品りに統一させることが出来る。

【００２６】また、本発明は各種の機械、器具設備等の取扱い説明書、補修手順書の代わりにことができる。更には、各種作業指導教育用に最適であり、この場合、言葉の障害を乗り越えで、教育コストを著しく低減できる。

【００２７】更にまた、遠距離において本発明とする場合には、インターネットを利用して送ので、技術者や技能者を海外に派遣する必要性る等の優れた諸効果を生じる。

【００２８】

【図面の簡単な説明】

【図１】本発明に係るシステムの一実施例を示チャートである。

【図２】組立品の投影図である。

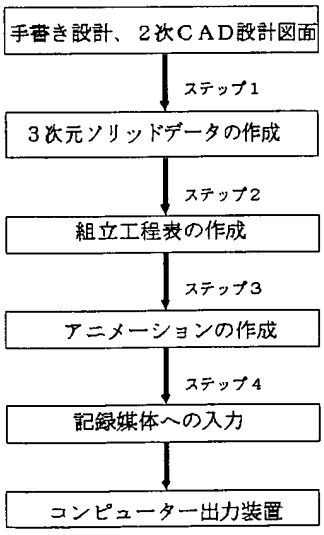
【図３】組立品の全体透視図である。

【図４】組立工程表Ａの一部を表わす投影図で

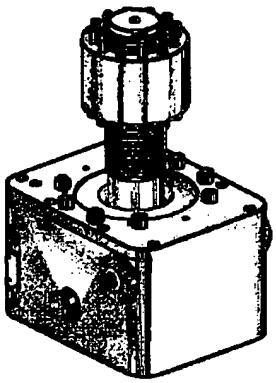
【図５】組立工程表Ｂの一部を表わす投影図で

【図６】組立工程表Ｂの一部を表わす投影図で

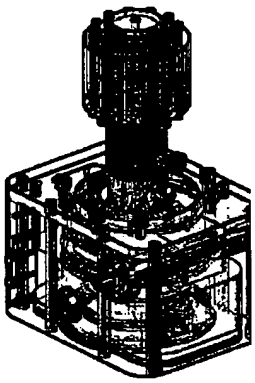
【図１】



【図２】



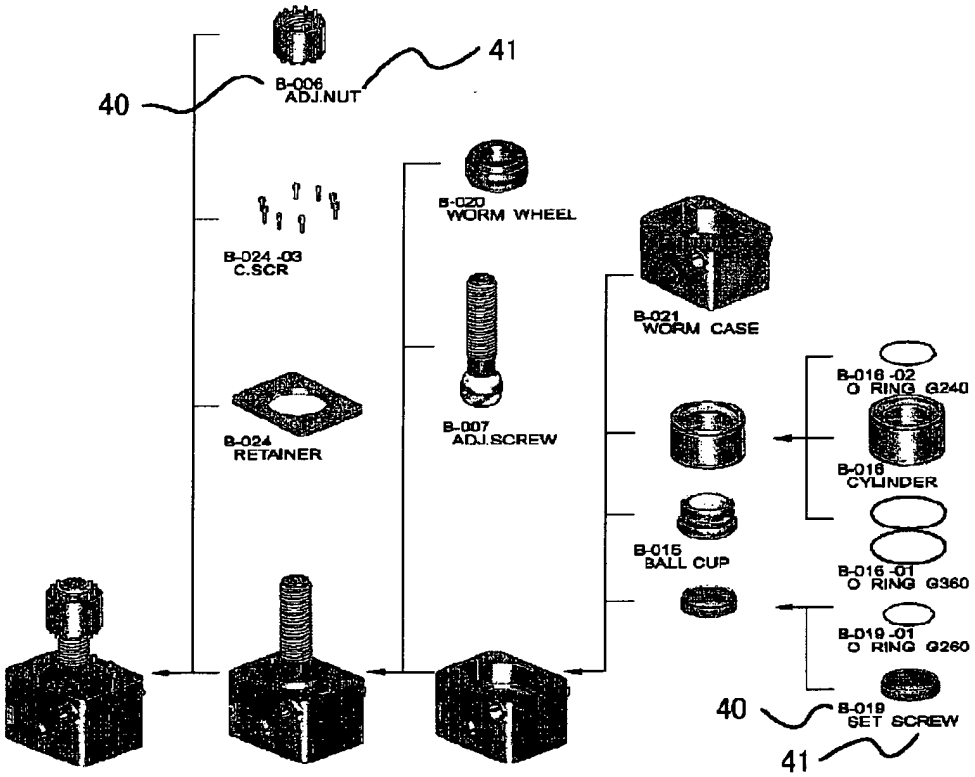
【図３】



BEST AVAILABLE COPY

【図４】

組立工程表A



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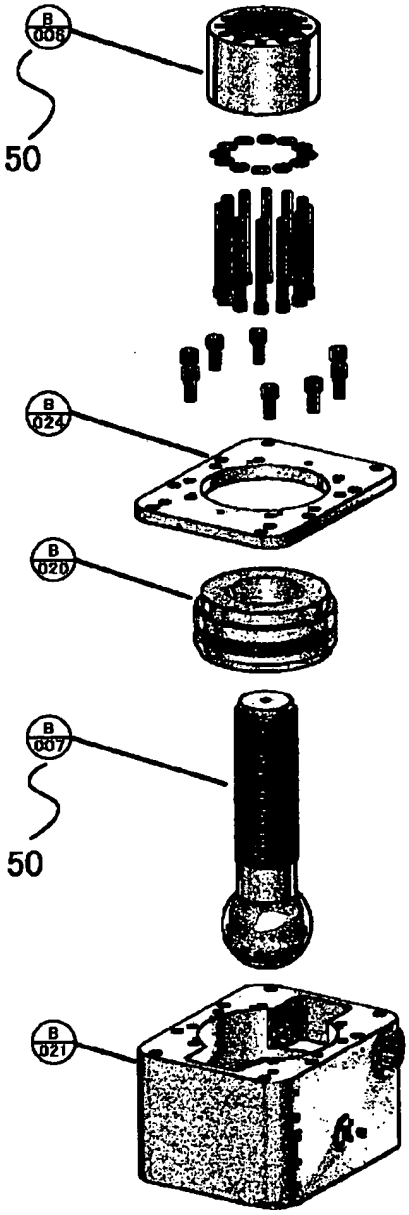
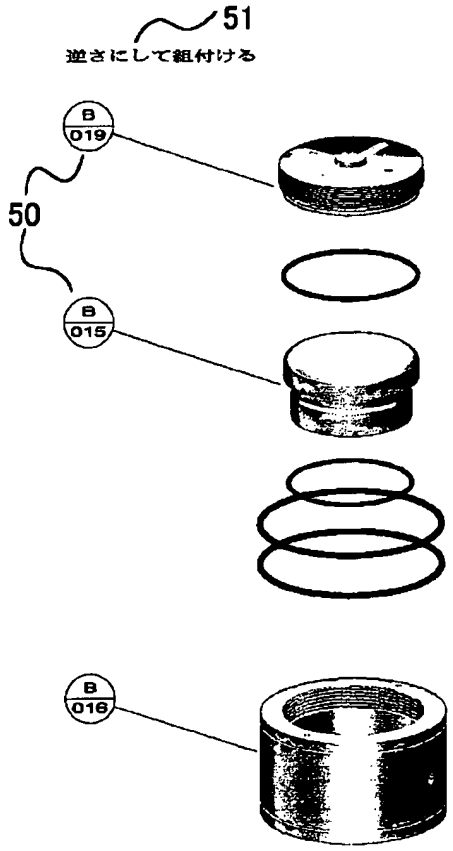
【図5】

組立工程表B



【図6】

組立工程表B



BEST AVAILABLE COPY